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ART UNIT	**PAPER NUMBER**
2835	

DATE MAILED: 04/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/792,101	XUE ET AL.	
	Examiner	Art Unit	
	Biju Chandran	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 21-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 21-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 5, 14, 16, 25 and 26 are rejected under 35 U.S.C. 102(a) as being anticipated by Oggioni et al.

   - Regarding claim 5, Oggioni et al. discloses a circuit board component, comprising: a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033, 0035), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface, a die coupled to the die interface defined by the conductive material of the substrate (paragraph 0021 and 0022 describe the interconnections between the die, the heat spreader and circuit board interface, since they are electrically connected, the conductive material of the substrate is exposed at the interface, and therefore, defines the interface), the die including integrated circuitry which is configured to electrically communicate with a circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the

substrate (paragraphs 0021, 0035); and a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die (paragraph 0004), the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface (paragraphs 0009, 0010; figure 3).

- Regarding claim 14, Oggioni et al. discloses a circuit board component, comprising: a heat spreader configured to dissipate heat from the circuit board component (paragraph 0004); a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) heat spreader connecting means (201) for physically and electrically connecting to the heat spreader, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader connecting means (paragraphs 0021, 0022, 0035), wherein the heat spreader and the heat spreader connecting means form an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of a circuit board through the circuit board interface (paragraphs 0009, 0010; figure 3); and a die

coupled to the die interface defined by the conductive material of the substrate (paragraph 0035), the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate (paragraph 0021).

- Regarding claim 16, Oggioni et al. further discloses a heat spreader interface defined by the conductive material of the substrate which includes: conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner (top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) to minimize escape of electromagnetic interface from the die during operation of the integrated circuitry (Oggioni et al., paragraph 0009).
- Regarding claim 25, Oggioni et al. further disclose that the conductive ground plates that are disposed along the flat surface of the substrate define a separation distance between adjacent ground plates (see figure 2).
- Regarding claim 26, Ogionni et al. further disclose that the separation distance is less than one-half the length of an electromagnetic wave (although Ogionni et al. does not disclose the distance between the adjacent ground plates, this distance will have to the less than one-half of some electromagnetic wave since electromagnetic waves can exist

in any wavelength, see attached description of the Electromagnetic waves from The Hutchinson Encyclopedia, Helicon Publishing Limited, 2001).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 6-8,10-13, 15, 21-24, 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oggioni et al. (PGPub US 2003/0174478) in view of Takeuchi (PGPub US 2003/0122242 A1).

   - Regarding claim 1, Oggioni et al. discloses a circuit board module, comprising: a circuit board having a component mounting location; a circuit board component mounted to the component mounting location of the circuit board (Figure 3), the circuit board component including: a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface, a die coupled to the die interface defined

by the conductive material of the substrate (paragraph 0035), the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate (paragraph 0021, 0035), and a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die (paragraph 0004), the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface (paragraphs 0009, 0010; figure 3). Oggioni et al. do not disclose a heat sink in thermal communication with the heat spreader. Takeuchi discloses a heat sink in thermal communication with the heat spreader of a circuit board module (Figure 6). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the heat sink in contact with the heat spreader as taught by Takeuchi in the circuit board module as disclosed by Oggioni et al. to improve thermal dissipation (Takeuchi, paragraph 0023).

- Regarding claim 2, Oggioni et al. further discloses a heat spreader interface defined by the conductive material of the substrate of the circuit board component which includes a conductive ground plane

disposed along a flat surface of the substrate (Top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) which minimizes the escape of electromagnetic interference from the die during operation of the integrated circuitry (paragraph 0010). Oggioni et al. do not disclose that the conductive ground plane completely encircles the die interface in a 360 degree manner. Takeuchi discloses a ground plane that completely encircles the die in a 360 degree manner (paragraph 0027). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the ground plane that completely encloses the die in a 360 degree manner as taught by Takeuchi in the circuit module as disclosed by Oggioni et al., to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claim 3, Oggioni et al. further discloses a circuit board module of claim 1 wherein the heat spreader interface defined by the conductive material of the substrate of the circuit board component includes: conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner (Top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) to minimize escape of electromagnetic interface from the die during operation of the integrated circuitry (Oggioni et al., paragraph 0009).

- Regarding claim 4, Oggioni et al discloses a circuit board module, comprising: a circuit board having a component mounting location (Figure 3); a circuit board component mounted to the component mounting location of the circuit board, the circuit board component including: a heat spreader configured to dissipate heat from the circuit board component (paragraph 0004), a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) heat spreader connecting means (201) for physically and electrically connecting to the heat spreader (paragraph 0033), and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader connecting means (paragraphs 0021 & 0022), wherein the heat spreader and the heat spreader connecting means form an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface (figure 3, paragraph 0009), and a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface (paragraph 0021) defined by the conductive material of the substrate. Oggioni et al. do

not disclose a heat sink in thermal communication with the heat spreader. Takeuchi discloses a heat sink in thermal communication with the hear spreader of a circuit board module (Figure 6). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the heat sink in contact with the heat spreader as taught by Takeuchi in the circuit board module as disclosed by Oggioni et al. to improve thermal dissipation (Takeuchi, paragraph 0023).

- Regarding claim 6, Oggioni et al. satisfy all the limitations of claim 5. and further discloses a heat spreader interface that includes a conductive ground plane disposed along a flat surface of the substrate (top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) which minimizes the escape of electromagnetic interference from the die during operation of the integrated circuitry (paragraph 0010). Oggioni et al. do not disclose that the conductive ground plane completely encircles the die interface in a 360 degree manner. Takeuchi discloses a ground plane that completely encircles the die in a 360 degree manner (paragraph 0027). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the ground plane that completely encloses the die in a 360 degree manner as taught by Takeuchi in the circuit module as

disclosed by Oggioni et al., to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claim 7, Oggioni et al. as modified by Takeuchi discloses all the limitations of claim 6, and further disclose that the conductive ground plane of the heat spreader extends along an outer periphery of the substrate (figure 4). Oggioni et al. do not disclose a conductive ground edge disposed along the outer periphery of the substrate, the conductive ground edge being contiguous with the conductive ground plane and extending from the conductive ground plane in a substantially perpendicular manner relative to the conductive ground plane to minimize escape of electromagnetic interference from the substrate during operation of the integrated circuitry. Takeuchi et al. discloses a conductive ground edge disposed along the outer periphery of the substrate, the conductive ground edge being contiguous with the conductive ground plane and extending from the conductive ground plane in a substantially perpendicular manner relative to the conductive ground plane (figures 3 & 4) to minimize escape of electromagnetic interference from the substrate during operation of the integrated circuitry (paragraph 0004). At the time the invention was made, it would have been obvious for one of ordinary skill in art to incorporate the conductive ground edge disposed along the outer periphery of the substrate with the conductive ground edge

contiguous with the conductive ground plane and extending from it in a substantially perpendicular manner, as taught by Takeuchi in the circuit board component as taught by Oggioni et al. to be able to incorporate more electrical components under heat spreader and to provide EMI protection for them (Takeuchi, figure 7, paragraph 0025, 0026).

- Regarding claim 8, Oggioni et al. further discloses that the heat spreader includes a main portion which extends along the flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate; and an edge portion which extends along the outer periphery of the substrate in a substantially parallel manner relative to the outer periphery of the substrate, where the edge portion is contiguous with the main portion. Oggioni et al. do not disclose that the edge portion extends from the main portion in a substantially perpendicular manner relative to the main portion. Takeuchi et al. disclose a heat spreader where the edge portion extends from the main portion in a substantially perpendicular manner relative to the main portion. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the heat spreader where the edge portion extends from the main portion in a substantially perpendicular manner relative to the main portion, as taught by Takeuchi in the circuit board component as taught by

Oggioni et al. to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claim 10, Oggioni et al. as modified by Takeuchi satisfies all the limitations of claim 5, and further disclose that the heat spreader interface includes: conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner (top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) to minimize escape of electromagnetic interface from the die during operation of the integrated circuitry (paragraph 0010).
- Regarding claim 11, Oggioni et al. do not disclose a ring shaped solder joint formed from high temperature solder which forms an electromagnetic interference seal between the heat spreader and the heat spreader interface defined by the conductive material of the substrate. Takeuchi discloses a ring shaped solder joint ('408', paragraph 0019) formed from high temperature solder which forms an electromagnetic interference seal between the heat spreader and the heat spreader interface defined by the conductive material of the substrate (paragraph 0004, 0015).
- Regarding claim 12, Oggioni et al. further discloses the heat spreader interface is disposed along a first flat surface of the substrate (figure 4),

wherein the circuit board interface is disposed along a second flat surface of the substrate (figure 2 & 4), wherein the first and second flat surfaces are substantially parallel to each other, wherein the circuit board interface includes an array of pads, and wherein the circuit board component further comprises: an array of circuit board contacts coupled to the array of pads, the array of circuit board contacts being configured to mount to an area array component mounting location of the circuit board using a surface mount technology soldering process (paragraph 0009, 0035).

- Regarding claim 13, Oggioni et al. further discloses that circuit board component is an Application Specific Integrated Circuit (paragraphs 0015, 0016).
- Regarding claim 15, Oggioni et al. discloses all the limitations of claim 14, and further discloses a heat spreader interface defined by the conductive material of the substrate which includes a conductive ground plane disposed along a flat surface of the substrate (Top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) which minimizes the escape of electromagnetic interference from the die during operation of the integrated circuitry (paragraph 0010). Oggioni et al. does not disclose that the conductive ground plane completely encircles the die interface in a 360 degree manner. Takeuchi discloses a ground plane

that completely encircles the die in a 360 degree manner (paragraph 0027). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the ground plane that completely encloses the die in a 360 degree manner as taught by Takeuchi in the circuit module as disclosed by Oggioni et al., to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claims 21, 23 and 27, Oggioni et al. as modified by Takeuchi discloses all the limitations of claims 3, 10 and 4 respectively. Oggioni et al. further disclose that the conductive ground plates that are disposed along the flat surface of the substrate define a separation distance between adjacent ground plates (see figure 2).
- Regarding claims 22, 24 and 28, Ogionni et al. further disclose that the separation distance is less than one-half the length of an electromagnetic wave (although Ogionni et al. does not disclose the distance between the adjacent ground plates, this distance will have to be ~~the~~ less than one-half of some electromagnetic wave since electromagnetic waves can exist in any wavelength, see attached description of Electromagnetic waves from The Hutchinson Encyclopedia, from Helicon Publishing Limited, 2001.)

4. Claim 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Oggioni et al. in view of Takeuchi as applied to claim 8 above, and further in view of Lee at al. (PGPub US 2004/0150102 A1). Oggioni as modified by Takeuchi satisfies all the limitations of claim 8, and further disclose electrically conductive material which forms an electromagnetic interference seal between the main portion of the heat spreader and the conductive ground plane of the heat spreader interface. However, Oggioni et al does not disclose electrically conductive material between the edge portion of the heat spreader and the conductive ground edge of the heat spreader interface. Lee et al. discloses electrically conductive material, which forms an electromagnetic interference seal between the edge portion of the heat spreader and the conductive ground edge of the heat spreader interface (figure 5, paragraph 0029). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the electrically conductive material between the edge portion of the heat spreader and the conductive ground edge of the heat spreader interface, as taught by Lee et al., in the circuit board component disclosed by Oggioni et al. to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

Response to Arguments

Applicant's arguments filed on 2/3/06 have been fully considered but they are not persuasive. Described below are the reasons why.

The gist of the applicants argument is that Oggionni does not "teach or suggest a heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface as claimed by the Applicant". (Applicants Arguments and Remarks, page numbered 14, beginning of the page; page numbered 15, end of first paragraph; page numbered 16, beginning of the page).

However, this is clearly indicated by Oggionni in figures 2 and 3, and associated description in paragraphs 0009 and 0010. Oggionni teaches that the heat spreader ('305' in figure 3, and '401' in figure 4) forms the top of the Faraday cage as shown in figure 3 and also described with reference to figure 4 in the middle of paragraph 0035 (a Faraday cage, as described in the middle of paragraph 0008 shields against electromagnetic interference), the via's and the plated through holes in the substrate in conjunction with the heat spreader interface, the solder balls and their interfaces forms the side surfaces of the Faraday cage as shown in figure 3. The ground plane in the circuit board forms the bottom surface of the Faraday cage as shown in figure 2. The cage is complete only when a portion of the circuit board interface (interface of the outer solder balls marked 203 in figure 2 that are part of the side surfaces of the cage) connects to the ground reference of the circuit board by being connected to the circuit board.

The Applicant points out in the second paragraph of the page numbered 18 that Takeuchi also does not teach the limitation quoted above. However, Takeuchi is relied

on only for his teaching of the "heat sink in thermal communication with the heat spreader". As described in the previous paragraph, Oggionni et al. teaches that the heat spreader in combination with the heat spreader interface forms an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Biju Chandran whose telephone number is (571) 272-5953. The examiner can normally be reached on 8AM - 5PM. Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynn Feild can be reached on (571) 272-2092. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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